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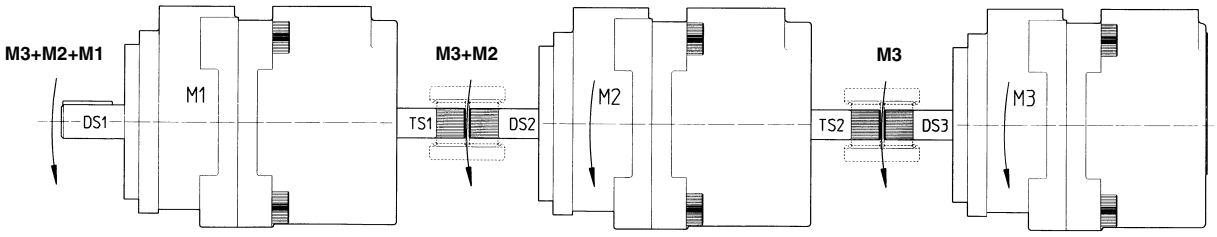
Multiple pumps type PFEX, PFRX, POX

vane, piston, gear type - fixed displacement

Multiple pumps are composed by various vane, radial piston or gear pumps assembled in modular way:
PFEX, see section 1, are composed by vane pumps PFE (table A005 and A007) or PFED (table A180);
PFRX, see section 2, are composed by vane pumps PFE (table A005 and A007) and radial piston pumps PFR (table A045)
POX, see section 3, are composed by radial piston pumps PFR (table A045) and gear pumps PFG (table A055)

For multiple pumps it must be verified that the max torques applied on each single drive shaft and on each single through shaft are not higher than the allowed limit values. In particular, it must be considered that the total torque applied to the drive shaft of the first element is the sum of the single torque needed for operating each single pump.



In the figure are shown:

M1, M2, M3, = torque needed to operate each single pump (obtainable from “torque versus pressure diagram” of each single pump).
L_{DS1}, L_{DS2}, L_{DS3} = limits of torque for drive shafts;
L_{TS1}, L_{TS2} = limits of torque at the end of through shafts.

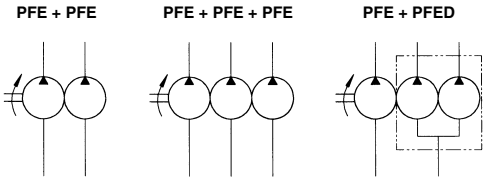
The values of torque needed to operate each single pump and the allowed limit torque values for drive shafts and through shafts are shown on technical tables of individual basic pumps.

For multiple pumps, the following verifications must be executed:

a) $M3 \le L_{TS2}$
b) $M3 + M2 \le L_{DS2}$
c) $M3 + M2 \le L_{TS1}$
d) $M3 + M2 + M1 \le L_{DS1}$

1 PFEX2, PFEX3, PFEXD MULTIPLE VANE PUMPS

PFEX* are fixed displacement multiple vane pumps. They can be double (composed by two pumps type PFE) or triple pumps (composed by three PFE or by one PFE and one PFED).



For technical characteristics of PFE-*1 pumps, see tab. A005; for technical characteristics of PFE-*2 see tab. A007; for technical characteristics of PFED pumps, see tab. A180.

1.1 MODEL CODE FOR PFEX*

PFEX **2** **– 42** **045** **/31028** **/** **3** **D** ****** **/***

Fixed displacement multiple vane pump

2 = double pump composed of two pumps type PFE
3 = triple pump composed of three pumps type PFE
D = triple pump composed of one pump type PFE and one pump type PFED, see note (1)
The pumps are assemled in decreasing order of size.

Size of first pump:
31, **41**, **51**, **32**, **42**, **52**

Displacement of first pump [cm³/rev]
for PFE 31: 016, 022, 028, 036, 044
for PFE 41: 029, 037, 045, 056, 070,085
for PFE 51: 090, 110, 129, 150
for PFE 32: 022, 028, 036,
for PFE 42: 045, 056, 070, 085
for PFE 52: 090, 110, 129, 150

Size and displacement [cm³/rev] of second (and third) pump

Drive shaft
cylindrical keyed:
1 = (only for PFE-31, 41, 51) standard
2 = (only for PFE-41 and PFE-51) according to ISO/DIN 3019
3 = for high torque applications

splined
5 = standard
6 = for high torque applications
for PFEX*-3 according to SAE B 16/32 DP, 13 teeth;
for PFEX*-4 according to SAE C 12/24 DP, 14 teeth;

Direction of rotation (as viewed at the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: PFE are not reversible

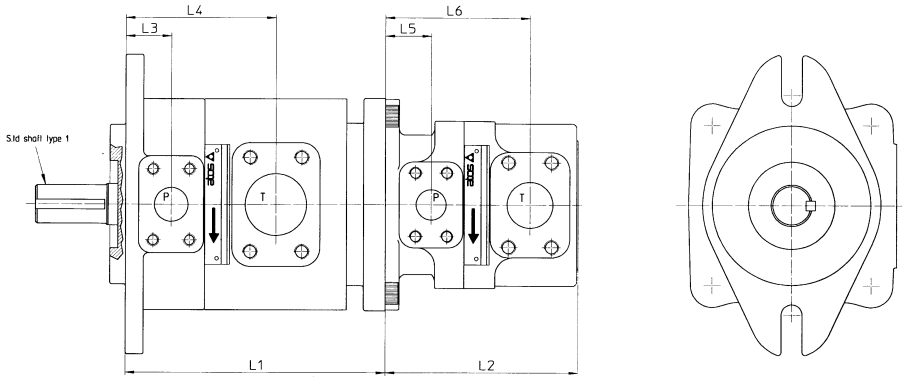
Design number

Synthetic fluids:
WG = water-glycol
PE = phopsphate ester

Note:
(1) PFEXD are available only in the following combinations: PFE-4* + PFED-43***, PFE-5* + PFED-54***
(2) multiple pumps are supplied with inlet and outlet ports in line. Ports orientation can be easily changed by rotating the pump body that carries inlet port.

1.2 DIMENSIONS OF MULTIPLE PUMPS TYPE PFEX2, PFEX3, PFEXD [mm]

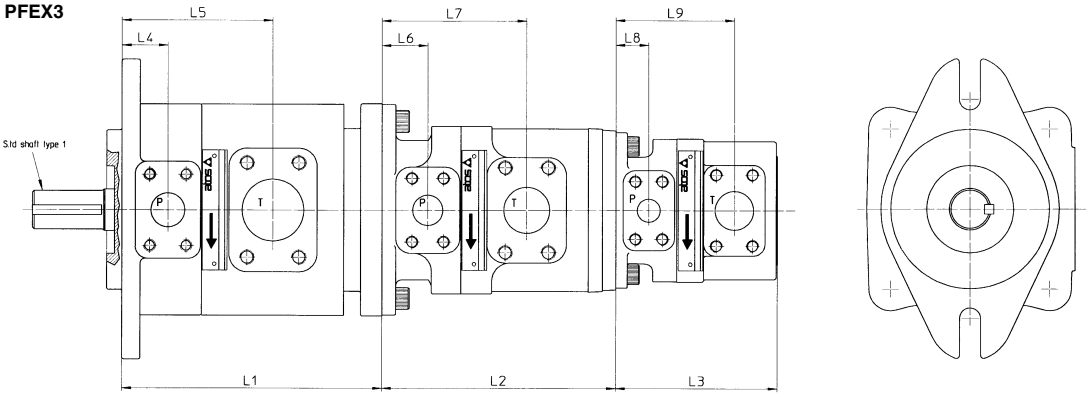
PFEX2



For missing details see tab. A005 and A007

Composed pump	First element	Second element	L1	L2	L3	L4	L5	L6
PFEX2-32***/31***/*	PFEXA-32***/*	PFE-31***/5	164	134,5	27,5	98,5	27,5	98,5
PFEX2-42***/31***/*	PFEXA7-42***/*	PFE-31***/7	194	134,5	38	120	27,5	98,5
PFEX2-42***/41***/*	PFEXB7-42***/*	PFE-41***/7	203	160	38	120	38	120
PFEX2-52***/31***/*	PFEXA7-52***/*	PFE-31***/7	206	134,5	38	125	27,5	98,5
PFEX2-52***/41***/*	PFEXB7-52***/*	PFE-41***/7	215,5	160	38	125	38	120
PFEX2-52***/51***/*	PFEXC-52***/*	PFE-51***/5	230	186,5	38	125	38	125

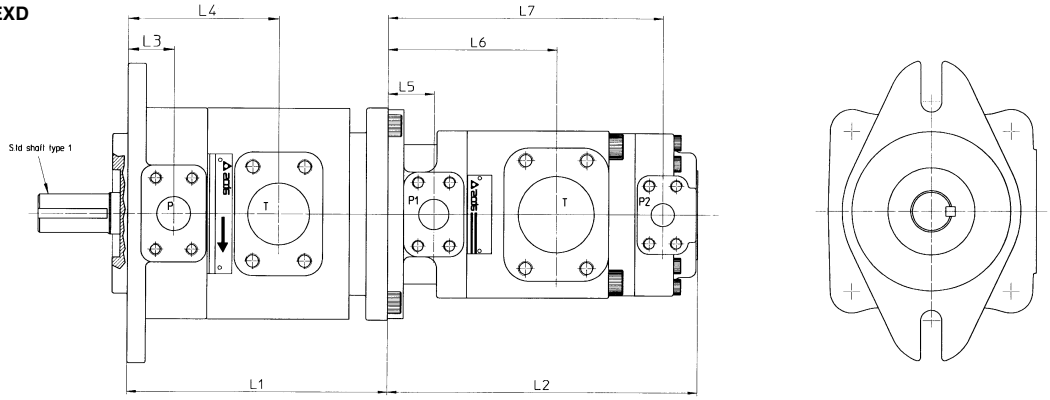
PFEX3



For missing details see tab. A005 and A007

Composed pump	First elem.	Second elem.	Third elem.	L1	L2	L3	L4	L5	L6	L7	L8	L9
PFEX3-32***/31***/31***/*	PFEXA-32***/*	PFEXA-31***/5	PFE-31***/5	164	164	134,5	27,4	98,5	27,4	98,5	24,7	98,5
PFEX3-42***/31***/31***/*	PFEXA7-42***/*	PFEXA-31***/7	PFE-31***/5	203	164	134,5	38	120	27,4	98,5	24,7	98,5
PFEX3-42***/41***/31***/*	PFEXB7-42***/*	PFEXA7-41***/7	PFE-31***/7	203	194	134,5	38	120	38	120	24,7	98,5
PFEX3-42***/41***/41***/*	PFEXB7-42***/*	PFEXB7-41***/7	PFE-41***/7	203	203	160	38	120	38	120	38	120
PFEX3-52***/31***/31***/*	PFEXA7-52***/*	PFEXA-31***/7	PFE-31***/5	206	164	134,5	38	125	24,7	98,5	24,7	98,5
PFEX3-52***/41***/31***/*	PFEXB7-52***/*	PFEXA7-41***/7	PFE-31***/7	215,5	194	134,5	38	125	38	120	24,7	98,5
PFEX3-52***/41***/41***/*	PFEXB7-52***/*	PFEXB7-41***/7	PFE-41***/7	215,5	203	160	38	125	38	120	38	120
PFEX3-52***/51***/31***/*	PFEXC-52***/*	PFEXA7-51***/5	PFE-31***/7	230	206	134,5	38	125	38	125	24,7	98,5
PFEX3-52***/51***/41***/*	PFEXC-52***/*	PFEXB7-51***/5	PFE-41***/7	230	206	160	38	125	38	125	38	120
PFEX3-52***/51***/51***/*	PFEXC-52***/*	PFEXC-51***/5	PFE-51***/5	230	230	186,5	38	125	38	125	38	125

PFEXD

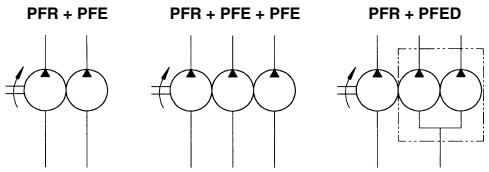


For missing details see tab. A005 and A007, A180

Composed pump	First element	Second element	L1	L2	L3	L4	L5	L6	L7
PFEXD-42***/43***/0**	PFEXB7-42***	PFED-43***/0**/7	203	256	38	120	38	139,6	227,7
PFEXD-52***/43***/0**	PFEXB7-52***	PFED-43***/0**/7	215,5	256	38	125	38	199,6	227,7
PFEXD-42***/54***/0**	PFEXC-52***	PFED-54***/0**/5	230	288	38	125	38	152,3	261,8

2 PFRX2E, PFRX3E, PFRXDE MULTIPLE PISTON/VANE PUMPS

PFRX*E are fixed displacement multiple piston/vane pumps. They can be double (composed by one pump type PFR and one pump type PFE) or triple pumps (composed by one pump type PFR and one pump type PFEX2 or by one PFR and one PFED).



For technical characteristics of PFR pumps see tab. A045, for technical characteristics of PFE-1* pumps see tab. A005; for technical characteristics of PFE-*2 see tab. A007, for technical characteristics of PFED pumps, see tab. A180.

2.1 MODEL CODE FOR PFRX*E

PFRX **2E** – **5** **22** / **31044** / **D** / ****** **/***

- PFRX: Multiple fixed displacement piston/vane pump
- 2E: Composition: **X2E** = double: PFR + PFE; **X3E** = triple: PFR + PFEX2; **XDE** = triple: PFR + PFED. The pumps are assembled in decreasing order of size.
- 5: Size of first pump type PFR: **3**, **5**
- 22: Displacement of first pump type PFR [cm³/rev] for **PFR-3** = 08, 11, 15; for **PFR-5** = 18, 22, 25
- 31044: Size and displacement [cm³/rev] of second (and third) pump
- D: Direction of rotation (as viewed at the shaft end): **D** = clockwise (supplied standard if not otherwise specified); **S** = counter clockwise. Note: PFRX*E are not reversible
- **: Design number
- /*: Synthetic fluids: **WG** = water-glycol; **PE** = phopsphate ester

2.2 OPERATING CHARACTERISTICS OF STANDARD DOUBLE PUMPS TYPE PFRX2E

at 1450 rpm with hydraulic oil having a viscosity of 24 mm²/s and 40° C

Standard model (1)	Speed range [rpm] (2)	RADIAL PISTON PUMP			VANE PUMP			
		Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (4)	Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (5)	Total flow [l/min]
PFRX2E-308/31036	600-1800	8	12,6	350	36,5	51	210	63,6
PFRX2E-308/31044					43,7	63	210	75,6
PFRX2E-308/41070					69,9	101	180	113,6
PFRX2E-308/41085					85,3	124	150	136,6
PFRX2E-308/51110					109,6	157	180	169,6
PFRX2E-308/51129					129,2	186	150	198,6
PFRX2E-311/31044		11,4	16,5	350	43,7	63	210	79,5
PFRX2E-311/41070					69,9	101	180	117,5
PFRX2E-311/41085					85,3	124	150	140,5
PFRX2E-311/51110					109,6	157	180	173,5
PFRX2E-311/51129					129,2	186	150	202,5
PFRX2E-315/41056		14,7	21,5	350	55,8	80	210	101,5
PFRX2E-315/41070					69,9	101	180	122,5
PFRX2E-315/51110					109,6	157	180	178,5
PFRX2E-315/51129					129,2	186	150	207,5
PFRX2E-518/31044		18,1	26	350	43,7	63	210	89
PFRX2E-518/41070					69,9	101	180	127
PFRX2E-518/41085					85,3	124	150	150
PFRX2E-518/51110					109,6	157	180	183
PFRX2E-518/51129					129,2	186	150	212
PFRX2E-522/41056		21,8	31,5	350	55,8	80	210	111,5
PFRX2E-522/41070					69,9	101	180	132,5
PFRX2E-522/51110					109,6	157	180	188,5
PFRX2E-522/51129					129,2	186	150	217,5
PFRX2E-525/41070		25,4	37	350	69,9	101	180	138
PFRX2E-525/51110					109,6	157	180	194
PFRX2E-525/51129					129,2	186	150	233

(1) Further composition of PFR and PFE double pumps are available on request. Other composition of PFRX2E must subject to verification of max torque limits allowed by the drive shafts of PFR and PFE and by the through shaft of PFR (320 Nm).
(2) Max speed is 1800 rpm for /PE versions; 1000 rpm for /WG versions
(3) Flow rate and power consumption are proportional to revolution speed
(4) Max pressure is 250 bar for /PE versions, 175 bar for /WG versions
(5) Max pressure is 160 bar for /PE and /WG versions.

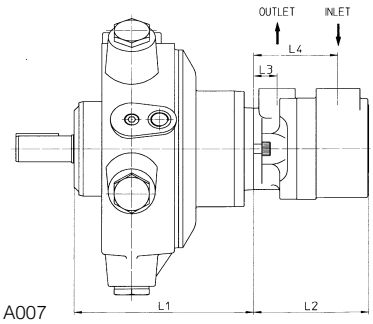
The shaft of the PFR pump has an eccentric cam which rotates with the shaft generating the stroke of the pistons and thus generating the flow rate. For best functioning a balanced coupling should be provided between the shaft of the motor and the shaft of the pump.
See tab. A045

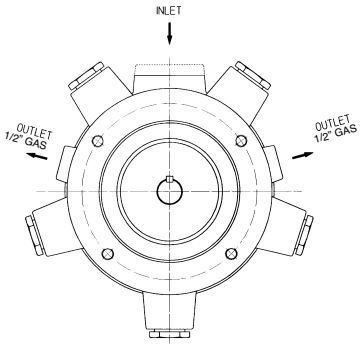
2.3 TRIPLE PUMPS TYPE PFRX3E AND PFRXDE

Many triple pump compositions PFRX3E = PFR + PFEX2 or PFRXDE = PFR + PFED can be realized but they must be subject to verification of max torque-limits allowed by drive shaft and through shaft of each individual basic pump according to description of first page.

2.4 DIMENSIONS OF MULTIPLE PUMPS TYPE PFRX2, PFRX3, PFRXD [mm]

PFRX2E

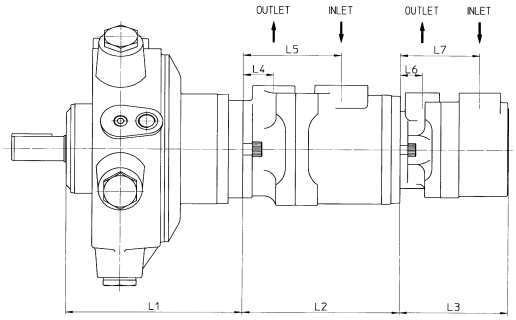


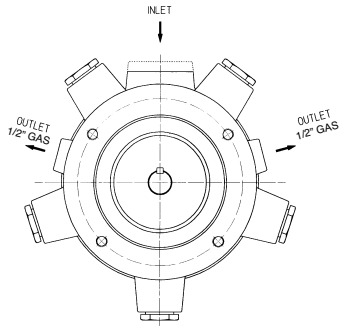


For missing details see tab. A045, A005 and A007

Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4
PFRX2E-3**/31***	PFRXA-3**	PFE-31***	200	134,5	27,5	98,5
PFRX2E-3**/41***	PFRXB-3**	PFE-41***	209	160	38	120
PFRX2E-3**/51***	PFRXC-3**	PFE-51***	224	186,5	38	125
PFRX2E-5**/31***	PFRXA-5**	PFE-31***	210	134,5	27,5	98,5
PFRX2E-5**/41***	PFRXB-5**	PFE-41***	219,5	160	38	120
PFRX2E-5**/51***	PFRXC-5**	PFE-51***	234	134,5	38	125

PFRX3E

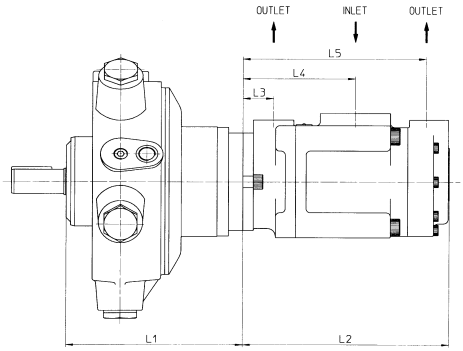


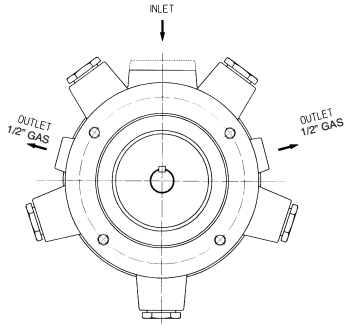


For missing details see tab. A045, A005 and A007

Composed pump	First element - piston pump -	Second element - vane pump -	Third element - vane pump -	L1	L2	L3	L4	L5	L6	L7
PFRX3E-3**/31**/31***	PFRXA-3**	PFEXA-31***	PFE-31***	200	164	134,5	27,5	98,5	27,5	98,5
PFRX3E-3**/41***/31***	PFRXB-3**	PFEXA-41***	PFE-31***	209	194	134,5	38	120	27,5	98,5
PFRX3E-3**/41***/41***	PFRXB-3**	PFEXB-41***	PFE-41***	209	203	160	38	120	38	120
PFRX3E-3**/51***/31***	PFRXC-3**	PFEXA-51***	PFE-31***	224	206	134,5	38	125	27,5	98,5
PFRX3E-3**/51***/41***	PFRXC-3**	PFEXB-51***	PFE-41***	224	215,5	160	38	125	38	120
PFRX3E-3**/51***/51***	PFRXC-3**	PFEXC-51***	PFE-51***	224	230	186,5	38	125	38	125
PFRX3E-5**/31***/31***	PFRXA-5**	PFEXA-31***	PFE-31***	210	164	134,5	27,5	98,5	27,5	98,5
PFRX3E-5**/41***/31***	PFRXB-5**	PFEXA-41***	PFE-31***	219,5	194	134,5	38	120	27,5	98,5
PFRX3E-5**/41***/41***	PFRXB-5**	PFEXB-41***	PFE-41***	219,5	203	160	38	120	38	120
PFRX3E-5**/51***/31***	PFRXC-5**	PFEXA-51***	PFE-31***	234	206	134,5	38	125	27,5	98,5
PFRX3E-5**/51***/41***	PFRXC-5**	PFEXB-51***	PFE-41***	234	215,5	160	38	125	38	120
PFRX3E-5**/51***/51***	PFRXC-5**	PFEXC-51***	PFE-51***	234	230	186,5	38	125	38	125

PFRXDE





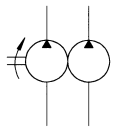
For missing details see tab. A045 and A180

Composed pump	First element - piston pump -	Second element - vane pump -	L1	L2	L3	L4	L5
PFRXDE-3**/43***/0**	PFRXB-3**	PFED-43***/0**	209	256,5	38	139,6	227,7
PFRXDE-3**/54***/0**	PFRXC-3**	PFED-54***/0**	224	288	38	152,3	261,8
PFRXDE-5**/43***/0**	PFRXB-5**	PFED-43***/0**	219,5	256,5	38	139,6	227,7
PFRXDE-5**/54***/0**	PFRXC-5**	PFED-54***/0**	234	288	38	152,3	261,8

PFRX*E pumps are supplied with WFA-32 inlet flange for PFR, and set of inlet, outlet flanges for PFE or PFED; see tab. K120 for more details.

3 POX MULTIPLE PISTON/GEAR PUMPS

POX are fixed displacement double piston/gear pumps composed by one piston pump type PFR and one gear pump type PFG. They have two separate inlet ports and two separate outlet ports.



For technical characteristics of PFR pumps, see tab. A045; for technical characteristics of PFG pumps see tab. A055.

3.1 MODEL CODE FOR POX

POX - 242 / D ** **

Fixed displacement piston/gear pump

Type:
242 = PFGXP-327 + PFRXF-202
262 = PFGXP-340 + PFRXF-202
282 = PFGXP-354 + PFRXF-202
245 = PFGXP-327 + PFRXF-203
265 = PFGXP-340 + PFRXF-203
285 = PFGXP-354 + PFRXF-203
349 = PFRXP-308 + PFGXF-327
370 = PFRXP-308 + PFGXF-340
390 = PFRXP-308 + PFGXF-354
355 = PFRXP-311 + PFGXF-327
375 = PFRXP-311 + PFGXF-340
395 = PFRXP-311 + PFGXF-354
359 = PFRXP-315 + PFGXF-327
379 = PFRXP-315 + PFGXF-340
399 = PFRXP-315 + PFGXF-354
Further composition of PFR and PFG pumps are available on request

Direction of rotation (as viewed at the shaft end):
D = clockwise (supplied standard if not otherwise specified)
S = counterclockwise
Note: POX are not reversible

Design number

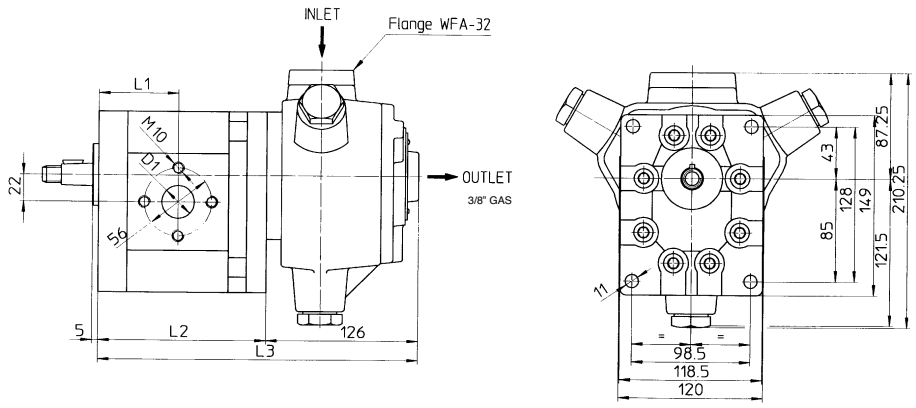
Synthetic fluids:
WG = water-glycol
PE = phosphate ester

3.2 OPERATING CHARACTERISTICS OF STANDARD POX at 1450 rpm with hydraulic oil having a viscosity of 24 mm²/s and 40° C

Standard model (1)	Speed range [rpm] (2)	RADIAL PISTON PUMP			GEAR PUMP			
		Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (3)	Displacement [cm³/rev]	Flow [l/min] (3)	Max pressure [bar] (5)	Total flow [l/min]
POX-242	600-1800	1,7	2,5	500	27	40,5	210	43
POX-262					40,3	60,5	175	63
POX-282					53,7	80,5		83
POX-245		3,5	5	500	27	40,5	210	45,5
POX-265					40,3	60,5	175	65,5
POX-285					53,7	80,5		85,5
POX-349		8,2	12,5	350	27	40,5	210	53
POX-370					40,3	60,5	175	73
POX-390					53,7	80,5		83
POX-355		11,4	16,5	350	27	40,5	210	57
POX-375					40,3	60,5	175	77
POX-395					53,7	80,5		87
POX-359		14,7	21,5	350	27	40,5	210	62
POX-379					40,3	60,5	175	82
POX-399					53,7	80,5		102

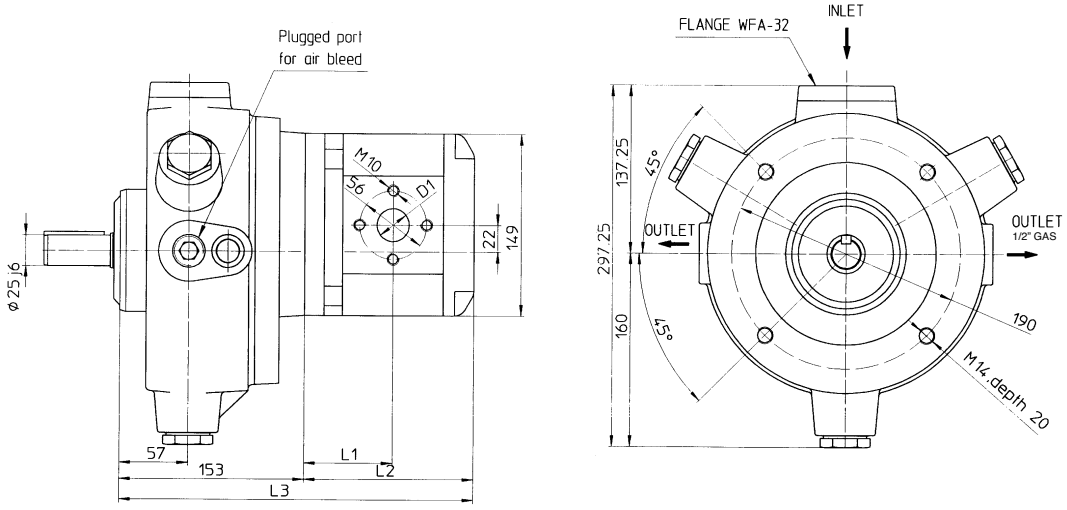
(1) Further composition of PFR and PFG pumps are available on request. Other pump composition must be subject to verification of max torque limits allowed by drive shaft and through shaft of every pump.
(2) Max speed is 1000 rpm for /WG versions and it is 1800 rpm for /PE versions.
(3) Flow rate and power consumption are proportional to revolution speed
(4) Max pressure is 250 bar for /PE versions and it is 175 bar for /WG versions.
(5) Max pressure is 140 bar for /PE versions and it is 100 bar for /WG versions.

3.3 DIMENSIONS OF MULTIPLE PUMPS TYPE POX [mm]



For missing details see tab. A045 and A055

Composed pump	First element - gear pump -	Second element - piston pump -	D1		L1	L2	L3
			Inlet	Outlet			
POX-242	PFGXP-327	PFRXF-202	27	19	66	139,5	265,5
POX-262	PFGXP-340	PFRXF-202	27	19	70,5	148,5	274,5
POX-282	PFGXP-354	PFRXF-202	27	27	75	157,5	283,5
POX-245	PFGXP-327	PFRXF-203	27	19	66	139,5	265,5
POX-265	PFGXP-340	PFRXF-203	27	19	70,5	148,5	274,5
POX-285	PFGXP-354	PFRXF-203	27	27	75	157,5	283,5



For missing details see tab. A045 and A055

Composed pump	First element - piston pump -	Second element - gear pump -	D1		L1	L2	L3
			Inlet	Outlet			
POX-349	PFRXP-308	PFGXF-327	27	19	73,5	141	294
POX-370	PFRXP-308	PFGXF-340	27	19	78	150	303
POX-390	PFRXP-308	PFGXF-354	27	27	82,5	159	312
POX-355	PFRXP-311	PFGXF-327	27	19	73,5	141	294
POX-375	PFRXP-311	PFGXF-340	27	19	78	150	303
POX-395	PFRXP-311	PFGXF-354	27	27	82,5	159	312
POX-359	PFRXP-315	PFGXF-327	27	19	73,5	141	294
POX-379	PFRXP-315	PFGXF-340	27	19	78	150	303
POX-399	PFRXP-315	PFGXF-354	27	27	82,5	159	312

POX pumps are supplied with WFA inlet flange for PFR, WLG-3-100 (inlet) and WLG-2-34 (outlet) elbow connections for PFG; see tab. K120 for more details